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Public Works (1914) Department.

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G.O. No. 437 I

DATED 1-9-14

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in this G.O. have been printed.

[Despatch Abstract.]

No. 11 Kuthalaperi tank and supply channel, Tenkasi Taluk, Tinnevelly Dt.

Sanctg: with remarks an estimate amtg: to Rs 20350 for improvements & repairs to ——.

BACK PAPERS.

G.O.	No.	Department.	Date.	G.O.	No.	Department.	Date

FURTHER PAPERS.

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Government of Madras.

PUBLIC WORKS DEPARTMENT.

IRRIGATION.
ACCOUNT.

Recd.	1914.	*Enclosures*
Regd.		*Spare copies*

G.O. No. 437 I., 1st September 1914.

No. 11, Kuthalaperi Tank and Supply Channel, Tenkasi Taluk, Tinnevelly District

Sanctioning, with remarks, an estimate amounting to Rs. 20,350 for improvements and repairs to —.

GOVERNMENT OF MADRAS.

PUBLIC WORKS DEPARTMENT.

Irrigation.
Account.

Read—the following papers :—

1

Letter—from M. R. Kharegat, Esq., A.M.I.C.E., Superintending Engineer, VI Circle.
To—the Chief Engineer for Irrigation.
Dated—Trichinopoly, the 8th/9th April 1914.
No.—555-C.E.

I have the honour to submit herewith for your approval and the sanction of Government an estimate amounting to Rs. 20,050 for improvements and repairs to No. 11, Kuthalaperi tank and supply channel, Chittar minor basin, Tenkāsi taluk, Tinnevelly district. The nature and scope of the improvements are explained in the report accompanying the estimate.

Enclosures.

(1)

CHITTAR RIVER MINOR BASIN, TINNEVELLY DISTRICT.

THANPATHUKULAM GROUP.

No. 11, KUTHALAPERI TANK.

Report.

This tank is situated about two miles south-west of No. 24, Thippanampatti village, Tenkāsi taluk. It receives the drainage from its free basin of 1·22 square miles besides a supply of 300 cusecs from a supply channel and surpluses into No. 10, Pudukulam tank at its left flank over a calingulah 36′ 9″ long. As the existing length of the calingulah is inadequate to dispose of the whole inflow into the tank, it is now proposed to extend it to a total length of 70 feet. The dam stones will be removed to the crest level. It has been ascertained from the Revenue officials that there is no practice of storing water above crest.

The bund from L.S. 17,350′ to L.S. 24,100′ for a total length of 6,750′ will be made up to 3′ above M.W.L. with top width 4′. The slopes will be $1\frac{1}{2}$: 1 in front and 2 : 1 in rear.

The prickly-pear on the bund will be cleared as far as necessary to allow of the execution of earth-work. A lump sum of Rs. 25 is allowed in the estimate.

The front slope of the bund will be revetted from L.S. 17,350′ to 18,950′; 19,800′ to 21,300′ and 22,400′ to 22,800′ to M.W.L. with stones $1\frac{1}{2}$′ thick and with 6″ gravel backing.

Irrigation is carried on by three masonry sluices. A lump sum of Rs. 45 is allowed for patch repairs to existing sluices at Rs. 15 each.

F.T.L. has been fixed at + 499·60 with reference to the average level of the crest of the calingulah. The dam stones will be removed to + 499·60 which is the level to which water is stored in the tank.

STANDARD TO BE MAINTAINED.

F.T.L.	+ 499·60 ft.
M.W.L.	+ 502·10 ,,
Top of bund	+ 505·10 ,,
Top width	4 ,,
Side slopes	$1\frac{1}{2}$: 1 & : 1.
Height of revetment above F.T.L.	2·50 ft.

BENCH MARKS.

I.—B.M. on R.S. stone in left bank of channel at C. S. No. 55 ...	+ 503·79 ft.
II.—B.M. on tower head wall of existing sluice No. 1 at C. S. No. 69.	+ 492·36 ,,
Datum—Mean Sea level ...	...

MAXIMUM DISCHARGE TO BE PROVIDED FOR.

Co-efficients: C = 500; c =	100.
Area of free basin	1·22 sq. miles.
Number of tanks above ...	..
Combined catchment area ...	..
Maximum discharge from combined catchment area.	570 c. ft.
Maximum discharge from channel ...	300 ,,
Total discharge to be provided for	870 ,,

SURPLUS ARRANGEMENTS.

Effective length of masonry escapes	36′ 9″	Total 70 ft.
Proposed additional length of masonry escapes ...	33′ 3″	
Discharge over total length.	870 c. ft.	
Effective length of byewashes	...	
Proposed additional length of byewashes	...	
Discharge over total byewashes	...	
Total maximum discharge provided for	870 c. ft.	

DETAILS OF STORAGE.

Area of waterspread at F.T.L.	5·44 mills. sq. ft.
Capacity of tank at F.T.L.	19·6 mills. c. ft.
Total annual storage ...	39·2 ,, ,,
Deep bed of tank	+ 490·00

DETAILS OF IRRIGATION.

Ayacut area	200·22 acres.
Average cultivation ...	199·23 ,,
Proposed ultimate area ...	215·59 ,,
Water stored per acre ...	0·18 mill. c. ft.

LEVELS OF SLUICES.

Sill of sluice No. 1 from the left flank	492·36 ft.
Sill of sluice No. 2 from the left flank	490·04 ,,
Sill of sluice No. 3 from the left flank	492·10 ,,

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(2)

Report to accompany the Estimate of Kuthalaperi Tank Supply Channel, Chittar Minor Basin (*Imp. No.* 117).

General.—The supply channel to Kuthalaperi tank takes off from the left margin of the Jambunadi river, above an anicut 171′ long, constructed across it, just where it emerges from the hills. It then runs for about $6\frac{1}{2}$ furlongs along the foot of the hill, until it joins another drainage vari, from the same hill. Here the discharge of both the channel and the drainage vari passes over an anicut 103′ long (called the Subrahmanya Thevan anicut) constructed across the vari and a branch channel takes off from above this anicut for the supply of Sembankulam tank. Below this second anicut, the channel is more or less a drainage vari down to the road culvert. At L.S. 11,750′ below this the channel carries only about 300 cusecs at M.W.L. The channel may thus be divided into three reaches—

(1) First reach from the anicut (at L.S. 1,400′) across the Jambunadi to L.S. 5,600′, *i.e.*, down to the second anicut across the drainage vari.

(2) Second reach from L.S. 5,600′ to 11,750′, *i.e.*, down to the road culvert.

(3) Third reach from L.S. 11,750′ to 17,350′, *i.e.*, where the channel enters the Kuthalaperi tank.

Anicut No. 1 *at L.S.* 1400′.—This is of pucca masonry and in good condition. For sundry patch repairs a lump sum of Rs. 25 is allowed in the estimate. The anicut is 171′ long as stated above with crest level at + 537·70 and is capable of discharging at the observed M.F.L. of + 539·95 the maximum drainage from the hilly catchment of 3·80 square miles amounting to 1,875 cusecs (*vide* hydraulic calculation). Since the supply channel in the first and second reaches receives drainages, to carry which it is found inadequate, and since any unexpected flood in the Jambunadi will otherwise add to the danger to the channel, a head sluice is proposed at the head of the supply channel at L.S. 1,400′ with 4 vents of 5′ × $2\frac{1}{2}$′ to discharge 110 cusecs at F.S.L.

Supply channel.—The supply channel is divided into three reaches as detailed above in paragraph 2, and is intended to take supply for Kuthalaperi, Kollankulam and Sembankulam tanks as also to irrigate directly 52·50 acres in the first reach and 192·93 acres in the second and third reaches.

The channel in the first reach will have a bed fall of 1 in 200, from 1,400′ to 3,100′, and being in good order will be kept as it is. From L.S. 3,100′ to 5,600′, the channel will be widened to 25′ bed width and 1 : 1 side slope with bed fall 1 in 800 to discharge 282 cusecs at M.F.L. depth of 2½′ and the right bank of the channel in that portion will be raised wherever necessary to 3′ above M.F.L.

Second anicut.—At L.S. 5,600′ there is the Subrahmanya Thevan anicut 103′ long with crest at + 523·30. This serves as an outlet to discharge the drainage surplus of 1,208 cusecs from the hilly catchment of 2·32 square miles above it with an M.F.L. depth, over crest, of 2¼′. There is no rear apron to this anicut, though there is a sudden drop of nearly 6′; it is therefore now proposed to lay a concrete apron 10′ wide with a retaining wall and another dry stone apron 6′ wide in rear. The wings being low will be raised, so as to be 2′ above M.W.L. and the existing irrigation cut in the body wall of the anicut will be left as it is.

Reach No. 2.—The bed fall in this reach is from + 516·60 in rear of the second anicut to + 503·50 in front of the road culvert at 11,750′. In this reach the channel has to carry, at M.F.L. depth of 5½′, 1,150 cusecs down to C.S. 29, and 1,570 cusecs below it. To carry the above discharges, the channel will be widened to 20′ bed width down to C.S. 29 and 30′ bed width below it down to the road culvert. These sections will carry at F.S.L. depth of 1⅓′ and 1′ respectively the full supply discharge of 95 cusecs entering this reach, after allowing 15 cusecs for the Sembankulam tank.

Outlet at 11,700′ — 11,750′.—Since the maximum discharge of 1,570 cusecs in the channel cannot pass through the road culvert, breaches often occur in the reach above, and it is therefore proposed to construct an outlet between L.S. 11,700′—11,750′ on the right bank of channel to discharge off 1,270 cusecs.

Road culvert at 11,750′.—This has got three vents of 4½′ × 5′ with sill at + 503·50 and is in good order. This is found to be capable of discharging 300 cusecs at M.F.L. depths in front and in rear of 5½′ and 5′ respectively and 95 cusecs and F.S.L. depths in front and rear of 2·75′ and 2·50′ respectively.

Third reach of supply channel 11,750′ to 17,350′.—This is proposed to be trimmed to 10′ bed width and 1 : 1 side slope with bed fall from + 503·50 in rear of road culvert to + 497·90 at 173·50, to discharge 300 cusecs at a M.F.L. depth of 5′ and 96 cusecs at F.S.L. depth of 2¼′ at 17,350′ where the channel enters the bed of the Kuthalaperi tank. From L.S. 5,600′ to the end of the third reach, the right bank will be raised and strengthened with a top width 4′ and side slopes 1½ : 1 and top of bank 2′ above M.F.L.

Outlet channel.—The discharge through the outlet is proposed to be run across the dry fields into the drainage vari about 2½ furlongs below the outlet, through a new channel to be excavated to a section of 15′ bed width and 1 : 1 side slope with a bed fall from + 500·00 in rear of the outlet to + 490·00 at its joining the drainage vari 1,500 below the outlet. This will carry 1,270 cusecs at an M.F.L. depth of 5′.

Sluices in the supply channel.—The direct irrigation under the channel is now carried on by means of four sluices and a cut at C.S. 17, 25, 29, 35 and 46 respectively. The first two are spout or pot sluices and are proposed to be replaced by cement pipe sluices. No. 3 spout sluice will be replaced by a masonry sluice. Sluice No. 4 is in good order and the cut at C.S. 46 will be replaced by a cement pipe sluice. The existing ayacuts under these sluices are 50·80, 60·27, 70·34, 24·95 and 14·24 acres, respectively, of which 70·34 acres is partly irrigated by the Sembankulam tank also. The proposed ayacuts under these sluices are 52·50, 63·40, 70·34, 24·95 and 14·24 acres, respectively of which the 70·34 acres will be partly irrigated by the Sembankulam also. The channel bank will be protected, wherever necessary, with revetment.

HYDRAULIC CALCULATIONS.

Kuthalaperi Tank and Supply Channel.

I. Supply channel. This is divided into three reaches—

(i) Reach No. 1—from Kuthalaperai anicut at L.S. 1,400′ to the Subrahmanya Thevan anicut at L.S. 5,600′ with bed fall from + 535·00 to + 523·30.

(ii) Reach No. 2—from the anicut at L.S. 5,600′ to the road culvert at 11,750′ with bed fall from + 516·60 to + 503·50, which latter is the sill of the road culvert.

(iii) Reach No. 3—from the road culvert to the entrance of channel into tank at L.S. 17,350′ with bed fall from + 503·50 to + 497·90.

II. (i) *Anicut at L.S.* 1,400′.—The drainage basin above the anicut across the Jambunadi river is 3·80 square miles free; $c = 750$ (the catchment being hilly).

Therefore maximum drainage discharge $= 750\ (3{\cdot}80)^{\frac{2}{3}}$
$= 750 \times 2{\cdot}44 = 1{,}830$ *cusecs*.

(ii) Length of anicut = 171′ with crest level at + 537·70; m.f.l. observed is 2¼′ above crest.

Therefore discharge over the anicut = $171 \times 3 \cdot 25 \times 2 \cdot 25^{\frac{3}{2}}$ – 1,875 cusecs.

Hence the anicut is quite adequate to discharge the maximum drainage quantity at the m.f.l. depth of 2¼′ over it.

III. Head sluice—

(i) The direct proposed ayacut under the channel = 225·43 acres.

(ii) The capacity of the Kuthalaperi tank = 19·60 m.c.ft.

Do.	Kollankulam	=	3·67 ,,
Do.	Sembankulam	=	3·60 ,,
	Total	..	26·87 m.c.ft.

The full supply quantity to be run in the channel during freshes in the river should be $\frac{26 \cdot 87 \times 1,000,000}{3 \times 24 \times 60 \times 60} = 104$ cusecs, as it is assumed that floods in the Jambunadi river will last for six days in a year and the tanks are to be filled twice in a year.

Add to this, six cusecs the discharge required for the direct irrigation of 225·50 + 44 = 269·50 or 270 acres at a duty of 45 acres per cusec.

Total F.S.L. discharge for which the head sluice and channel has to be designed is (104 + 6) or 110 *cusecs.*

The anicut crest level is + 537·70.

(iii) The sill of head sluice proposed is + 535·00.

It is proposed to have four vents of 5′ × 2½′.

Then area of the vent-ways = 50 sq. ft.

F.S.L. in front of the head sluice + 537·70 and in rear + 537·50. Therefore head = 0·20′.

Then discharge through the head sluice (taking $c = \cdot 625$). = $5\,A\sqrt{h} = 5 \times 50\sqrt{0 \cdot 20}$ = 110 cusecs.

IV. Supply channel, first reach.—This is divided into two portions (i) from L.S. 1,400′ to 3,100′ and (ii) from L.S. 3,100′ to 5,600.′

The bed-fall from L.S. 1,400′ to 3,100′ is from + 535·00 to + 526·50;
i.e., 8·50′ in 1,700′ or 1 in 200; $\sqrt{s} = 1/14 \cdot 14$.

Taking *c.s.* 7., A. at F.S.L. depth of 2½ ft. = 30 sq. ft.
$B = 16$; $r = 1 \cdot 89$; $\sqrt{r} = 1 \cdot 4$ nearly;
$C = 74$.
$D = 74 \times 30 \times 1 \cdot 4/14 \cdot 14 = 2,220/10 = 222$ cusecs.

Taking *c.s.* 8., $A = 40$; $B = 28$; $r = 1 \cdot 43$; $\sqrt{r} = 1 \cdot 2$
$C = 121 \cdot 6 + \cdot 562/1 + 42 \cdot 2 \times \cdot 019$
i.e. = 122·2/1·80 = 68.

Therefore $D = 68 \times 40 \times \frac{12}{14 \cdot 14} = \frac{2,720}{12} = 227$ cusecs.

Taking C.S. 10, $A = 40$; $B = 32$; $r = 1 \cdot 25$; $\sqrt{r} = 1 \cdot 12$ nearly; $C = 65$; $D = 65 \times 40 \times \frac{1 \cdot 12}{65} = 200$ nearly.

So this portion of channel from L.S 1,400′ to 3,100, is capable of discharging the full supply quantity easily without any improvements to it.

(ii) Between L.S. 3,100′ and 5,600′, the fall is from + 526·50 to + 523·30, or 3·20′ in 2,500′ or 1 in 781. Therefore $\sqrt{s} = 1/28 \cdot 2$. In this reach the discharge from the free hilly basin of 0·23 square miles, gradually enters the channel which comes to $(0 \cdot 23)^{\frac{3}{4}} \times 750 = 281$ cusecs. Between 3,100′ and 5,600′, the discharge will increase from 110 cusecs to 281 cusecs.

Taking 25′ bed width and 2½′ depth at F.S.L. or 2·60 ft. at m.f.l., $A = (25 + 2\tfrac{1}{2})\,2\tfrac{1}{2} = 68 \cdot 75$; $B = 32 \cdot 08$; $r = 2 \cdot 14$; $\sqrt{r} = 1 \cdot 462$; $N = \cdot 0225$, $V = 3 \cdot 89$; $D = 68 \cdot 75 \times 3 \cdot 89 = 267 \cdot 43$ cusecs.

D with 2·6 ft. = $71 \cdot 76\text{A} \times 3 \cdot 98 = 285 \cdot 6$ cusecs.
and so with 25 bed width and 1 : 1 side slope and a bed fall of 1 in 781, the discharge of 281 cusecs will be effected.

V. Subrahmanya Thevan Anicut—

Area of combined basin above the anicut = 2·32 square miles.

Area of combined free basin = 1·85 square miles.

Therefore maximum discharge from the basin = $(2 \cdot 32)^{\frac{3}{4}} \times 750 - 150\ (0 \cdot 47)^{\frac{3}{4}}$
$= 1 \cdot 75 \times 750 - 150 \times \cdot 605 = 1,312 \cdot 5 - 91 = 1,221$ cusecs.

This will be discharged over the anicut with a head of $2\frac{1}{4}$ thus at m.f.l. and by the Sembankulam tank channel.

Length of anicut = 103′, crest level is + 523·30 (average) m.f.l. + 525·55

Therefore discharge = $2/3 \times 10/16 \times 8 \times 103 \times 2{\cdot}25^{\frac{3}{2}}$ = 1,159 cusecs.

For Sembankulam tank channel—

m.f.l. ... ... + 525·55

and bed-fall is 1 in 500 (as existing)

$A = 25$; $B = 13$; $r = 1{\cdot}92$; $\sqrt{r} = 1{\cdot}4$; $c = 73$.

$D = 25 \times 73 \times 1{\cdot}4/22{\cdot}5 = 58$ cusecs.

VI. Second reach.—L.S. 5,600′ to 11,750′.

The quantity entering the second reach is (110 — 14) = 96 cusecs, at f.s.l. and 1,159 at M.W.L. taking the existing condition of the channel between the second anicut and C.S. 29 say at C.S. 23, 25, 26 and 28, respectively.

At C.S. 23, M.F.L. is + 521·24 (*i.e.*, $5\frac{1}{2}'$ above the theoretical bed).

A at m.f.l. = 88 ; B = 33 ; $r = 8/3$; $\sqrt{r} = 1{\cdot}65$; C = 80.

$D = 80 \times 88 \times 1{\cdot}65/21{\cdot}6 = 4{,}840/9 = 540$ cusecs.

At *c.s.* 25, m.f.l. is + 520·39 ($5\frac{1}{2}'$ above theoretical bed) ;

$A = 100$; $B = 25$, $\sqrt{r} = 2$; $c = 83$; $D = 83 \times 100 \times 2/21{\cdot}6 = 770$ cusecs.

From this it is seen that the discharging capacity of the channel in this reach is not sufficient. It is therefore proposed to widen it to the sections as worked out below—

Taking a bed width of 20′ and 1 : 1 side slope and the bed-fall 1 in 470, and M.F.L. depth $5\frac{1}{2}'$—

$A = 140{\cdot}25$, $B = 35{\cdot}56$; $r = 3{\cdot}94$; $\sqrt{r} = 1{\cdot}984$;

$V = 7{\cdot}60$; $D = A \times V = 140{\cdot}25 \times 7{\cdot}6 = 1{,}066$.

against 1,159 cusecs to be discharged, and the channel may therefore be widened to that section down C.S. 29 where the surplus of Sembankulam tank enters the channel.

IV. Below C.S. 29, the maximum discharge in the channel will be 1,159 cusecs + the surplus discharge from Sembankulam + the discharge from the combined basin of 0·75 square mile = 1,159 + 58 which is the Sembankulam channel discharge + $500\,(0{\cdot}75)^{\frac{2}{3}} - 100\,({\cdot}4)^{\frac{2}{3}}$ = 1,159 + 58 + 358 = 1,575 cusecs.

Therefore below C.S. 29 taking a bed width of 30′ and $5\frac{1}{2}'$ depth at M.F.L. and side slopes 1 : 1 and the same bed-fall as before—

$A = (30 + 5{\cdot}5)\,5{\cdot}5 = 195\frac{1}{4}$; $B = 45{\cdot}56$; $r = 4{\cdot}28$; $\sqrt{r} = 2{\cdot}068$; $V = 8{\cdot}03$ ft. per second.

$D = \overset{A}{195{\cdot}25} \times \overset{V}{8{\cdot}03} = 1{,}568$ cusecs.

So this section will be adopted from C.S. 29 to the road culvert at 11,750′.

VII. Road culvert at 11,750′.—This road culvert is of 3 spans of $4\frac{1}{2}' \times 5'$ with sill at + 503·50.

Therefore, area of ventway = $67\frac{1}{2}$ sq. ft.

and discharge at M F.L. depth $5\frac{1}{2}'$ in front and 5′ in rear

$= 67\frac{1}{2} \times 6{\cdot}4\,\sqrt{0{\cdot}5} = 302{\cdot}4$ cusecs or 300 cusecs nearly.

at M.F.L. in channel.

The road culvert will pass the F.S. discharge of 95 cusecs with 2·75 in front and 2·5 in rear.

VIII. Proposed outlet L.S. 11,700′ to 11,750′.—Therefore the maximum quantity the outlet has to be designed to discharge = 1,575 — 300 = 1,275 cusecs.

Bed level of channel opposite the outlet is + 503·50. So in order that the outlet may serve as a scouring sluice and a surplus weir, it is proposed to keep the crest level of the outlet at + (503·50 + 2·75) = 506·25 and the sill of vents at + 502·50, *i.e.*, 1′ below the theoretical bed level.

M.W.L. of the channel opposite the outlet is + 503·50 + 5·50 = 509·00.

Discharge over the crest = $3{\cdot}33 \times 36 \times (2{\cdot}75)^{\frac{3}{2}} = 547$ cusecs.

and through vents $= 6{\cdot}4 \times 5 \times 4 \times 3 \times (3{\cdot}5)^{\frac{1}{2}}$

$= 32 \times 12 \times 1{\cdot}875 = 720$ cusecs

$= 547 + 720 = 1{,}267$.

Total discharge through the outlet = 1,267 cusecs.

The vents will be provided with needle shutters.

In the second reach, the F.S.L. discharge will be 110 cusecs — 14 = 96 cusecs, (the 14 cusecs being taken by the Sembankulam channel).

(i) To discharge this with 20′ bed width

then $A = (20 + 2) \times 2 = 44$; $B = 20 + 5{\cdot}64 = 25{\cdot}64$.

$r = 1{\cdot}71$ nearly; $\sqrt{r} = 1{\cdot}307$.

$c = 70$.

Fall = 1/470; $N = {\cdot}0225$, $V = 4{\cdot}28$; $D = 44 \times 4{\cdot}28 = 188$ cusecs.

The depth will be $1\frac{1}{2}'$; $A = (20 + 1\frac{1}{2}) \times 1\frac{1}{2} = 32\frac{1}{4}$;

$B = 20 + 4{\cdot}2 = 24{\cdot}24$; $r = 32\frac{1}{4}/24{\cdot}2 = 1{\cdot}33$; $\sqrt{r} = 1{\cdot}15$.

$V = 3{\cdot}57$; $D = 32\frac{1}{4} \times 3{\cdot}57 = 115$ cusecs.

Hence this is the F.S.L. depth in the second reach from 5,600′ to C.S. 29:

(ii) Below it, since the bed width is 30′, the discharge at an F.S.L. depth of 1′ will be :—

$A = (30 + 1) \times 1 = 31$; $B = 32{\cdot}8$; $r = 0{\cdot}95$; $\sqrt{r} = {\cdot}974$.

$C = 63$; $D = 63 \times 31 \times 1/21{\cdot}6 = 95$ cusecs nearly.

So at the F.S.L. depth of 1′ the discharge of 95 cusecs will be effected by the channel in this portion. But the F.S.L. in front of culverts will head up to 2·75′ depth.

IX. Third reach.—Bed-fall in this reach is from + 503·50 to + 497·90 or 5·6′ in 5,600′ or 1 in 1,000.

The maximum discharge running into it will be 300 cusecs as calculated for the discharge through the road culvert at M.F.L. and 96 cusecs at F.S.L.

Taking the M.F.L. and F.S.L. depths at 5′ and $2\frac{1}{2}'$ respectively in this third reach

at c.s. 47, A at M.F.L. = 85; $B = 33$; $r = 2{\cdot}56$; $\sqrt{r} = 1{\cdot}6$; $c = 76$; $s = 1/1000$

$\sqrt{s} = \frac{1}{32}$;

$D = 85 \times 76 \times 1{\cdot}6/32 = 323$ cusecs,

which is more than the M.F.L. discharge and with $2\frac{1}{2}'$ depth at F.S.L. discharge will be :—

Since $A = 31\frac{1}{4}$; $B = 17{\cdot}08$; $r = 1{\cdot}83$; $\sqrt{r} = 1{\cdot}35$; $c = 72$.

$D = 72 \times 125/4 \times 1{\cdot}35/32 = 96$ cusecs,

and in order that there may be this 96 cusecs discharge at F.S.L. through the culvert, when the rear F.S.L depth = $2\frac{1}{2}'$, afflux will be $x = 96^2/6{\cdot}4 \times 30^2 = 96 \times 96/192 \times 192 = \frac{1}{4} = 0{\cdot}25'$; giving thereby the F.S.L depth in front of culvert to be 2·75′.

Hence the outlet crest must be kept at 2·75′ above the sill of the culvert, *i.e.*, at + 506·25.

X. Outlet channel at 11,700′.—The discharge through the outlet = 1,270 cusecs, for which the channel section has to be designed.

The bed-fall is from + 500·00 to + 490·00

10′ in 1,500 or 1 in 150; $\sqrt{s} = 1/12{\cdot}25$.

Taking a bed width of 15′ and side slope 1 : 1 and a depth of 5′ at M.W.L.—

$A = (15 + 5)\,5 = 100$.

$B = 29{\cdot}14$; $r = 3{\cdot}43$; $\sqrt{r} = 1{\cdot}85$.

$D = A \times V = 100 \times 12{\cdot}26 = 1{,}226$ cusecs.

Hence this section of 15′ bed width with 1 : 1 slopes is adopted. The banks will be raised with the spoil got from excavation.

8th April 1914.

M. R. Kharegat,
Superintending Engineer, V Circle.

II

Letter—from M.R.Ry. K. V. Sankara Ayyar Avargal, B.A., B.E., Assistant Engineer in charge of No. 2 Sub-division, Tank Restoration Scheme.

To—the Executive Engineer, Tank Restoration Scheme Division.

Dated—the 29th April 1914.

No.—416.

[*Grant for works in Chittar Minor Basin.*]

I have the honour to request you to be good enough to send for execution estimates for works in the Chittar minor basin, as the balance of estimates in hand is only about Rs. 1,600 against a grant of Rs. 10,000 allotted for this year.

No. 449-S.E., dated 9th May 1914.

Copy submitted to the Superintending Engineer for information and favour of early sanction to the estimates remaining yet to be sanctioned in Chittar minor basin.

K. V. Sankara Ayyar,
Executive Engineer, T.R.S. Division.

No. 764-C.E., dated 26th May 1914.

Copy forwarded to the Chief Engineer for Irrigation for favour of obtaining early sanction of Government to the estimate for repairs to No. 11, Kuthalaperi tank of Thenpathukulam group forwarded with this office No. 555-C.E., dated 9th April 1914.

M. R. Kharegat,
Superintending Engineer, VI Circle.

III

Note by the Chief Engineer for Irrigation, No. 2222/14-1, dated 12th August 1914.

With the first of the letters read above, the Superintending Engineer, VI Circle, submits for sanction an estimate amounting to Rs. 20,050 for improvements and repairs to No. 11, Kuthalaperi tank and supply channel, Chittar minor basin, Tenkāsi taluk, Tinnevelly district. The necessity for the improvements is explained in the report accompanying the estimate.

The estimate provides for—

	RS.
(1) Improvements to Kuthalaperi tank and channel	13,680
(2) Repairs to existing anicut No. 1	25
(3) Proposed head sluice at head of supply channel	1,410
(4) Improvements to anicut No. 2 or Subrahmanya Thevan anicut ...	745
(5) Proposed outlet at L.S. 11,700 feet	1,330
(6) Excavating a surplus channel from the outlet	1,220
(7) Improvements to the existing calingulah at the right flank of the tank	730
(8) Three cement pipe sluices and one masonry sluice	775
(9) Unforeseen works including planting bench-marks stones to channel and tank	135
Total ...	20,050

2. The following alterations have been made in the Superintending Engineer's estimate :—

(*a*) *Item No.* (4)—*Improvements to Subrahmanya Thevan anicut.*—Wings raised to 2′ above M.W.L.

Cement concrete substituted for surki concrete in the top 6″ of the 10-ft. apron.

The above alterations have increased the estimate for this item from Rs. 745 to Rs. 1,015.

(*b*) *Item No.* (5)—*Outlet.*—Wings raised to 2′ above M.W.L.

Width of concrete under the front wings increased by 3″. The estimate for this item has been increased from Rs. 1,330 to Rs. 1,360.

3. With regard to item No. (1), the Superintending Engineer should satisfy himself as to the necessity for revetment, which should not be carried out, unless really required for the safety of the tank.

4. The value of the land proposed to be acquired for the surplus channel does not appear to have been verified by the Revenue Department. It should have been ascertained beforehand from a responsible officer of that department. This should be done now.

5. The estimate as altered in this office, amounting to Rs. 20,350, is recommended for sanction.

W. J. J. Howley,
Offg. Chief Engineer for Irrigation.

To the Joint Secretary to Government,
Public Works Department (Irrigation Branch).

Order—No. 437 I., dated 1st September 1914.

The recommendation of the Chief Engineer for Irrigation is approved and the following estimate is sanctioned :—

Provincial.

Irrigation.

43. Minor Works and Navigation.

Class III. Minor Works for which neither Capital nor Revenue Accounts are kept.

(*a*) In charge of the Public Works Department.

Tank Restoration Scheme Repairs.

Tank Restoration Scheme Division, VI Circle.

Improvements and Repairs to No. 11, Kuthalaperi tank and supply channel, Tenkāsi taluk, Tinnevelly district.

	RS.
Estimate	20,350

2. The sanction accorded above is registered as No. 62 I. of 1914–15.

3. The attention of the Superintending Engineer, VI Circle, is drawn to paragraphs 3 and 4 of the foregoing note by the Chief Engineer for Irrigation.

(True Extract.)

W. J. J. Howley,
Offg. Joint Secretary to Govt., P. W. D.
(Irrigation Branch).

To the Chief Engineer for Irrigation.
" Superintending Engineer, VI Circle,
with plans and estimates.
" Accountant-General, Madras.

Forwarded to the

(By Order.)

Deputy Registrar.

PUBLIC WORKS DEPARTMENT
(IRRIGATION BRANCH).

NOTES CONNECTED WITH G.O. No. 437 I., DATED 1ST SEPTEMBER 1914.

[SUBJECT.—*Repairs and improvements to No.* 11, *Kuthalaperi tank and supply channel, Tenkāsi taluk, Tinnevelly district.*]

Note by the Chief Engineer for Irrigation, dated 12*th August* 1914, *No.* 2222/14–1.

Under Secretary—
Joint Secretary—

With his letter No. 555 C.E., dated 8th April 1914, the Superintending Engineer, VI Circle, submitted an estimate for repairs and improvements to No. 11, Kuthaleperi tank and supply channel, Chittar minor basin, Tenkāsi taluk, Tinnevelly district, for the sanction of Government under G.O. No. 49 I., dated 13th February 1911. The estimate has been checked by the Chief Engineer for Irrigation who has made certain alterations therein; and in his note read above the Chief Engineer recommends the sanction of the estimate as altered by him. His recommendations may be approved.

A draft order is submitted which, if approved, may be sent to Revenue for perusal before circulation to Honourable Member.

A.V.S.—13-8-14.

F. E. MORGAN—13-8-14.
W. J. J. HOWLEY—13-8-14.

To Revenue Department u.o.

REVENUE DEPARTMENT.

Under Secretary—

May be perused and returned with thanks.

S.A.R.—15-8-14.
R.S.—15-8-14.

H. A. WATSON—15-8-14.

To Public Works Department (*Irrigation*) *u.o.*

PUBLIC WORKS DEPARTMENT
(IRRIGATION BRANCH).

Under Secretary—
Joint Secretary—

The draft may be circulated to Honourable Member.

A.V.S.—17-8-14.

F.E.M.—17-8-14.

Honourable Member—

W.J.J.H.—17-8-14.

We shall get no return apparently for this expenditure: is it all really necessary?

H. A. S[TUART]—18-8-14.

Honourable Member—

The proposed expenditure appears to be all really necessary, except perhaps the revetment (estimated to cost Rs. 7,800), which the Superintending Engineer is being asked not to carry out unless it is really required for safety of the tank.

W.J.J.H.—27-8-14.

H. A. S[TUART]—28-8-14.

Issue.

A.V.S.—28-8-14.

W.J.J.H.—28-8-14.

[G.O. No. 437 I., dated 1st September 1914.]

From the Supg.Engineer Vl Circle.No.555 C.E.dated 9-4-1914

--do-- 764 C.E.dated 26-5-1914.

Note by the Chief Engr.for Irrign.
No 2222/14-1 d 12.8.14

With the first of the letters read above, the Supg.Engr.Vl Circle submits for sanction an estimate -- amounting to Rs 20,050 for improvements and repairs to No.11 Kuthalaperi Tank and supply channel, Chittar Minor Basin, Tenkasi Taluk, Tinnevelly Dt. The necessity for the improvements is explained in the Report accompanying the estimate.

The estimate provides for

		Rs
(1)	Improvements to Kuthalaperi Tank & Channel -	13,680
(2)	Repairs to existing Anicut No.1 - - -	25
(3)	Proposed Head-sluice at head of supply channel	1,410
(4)	Improvements to Anicut No.2 or Subramania Thevar anicut	745
(5)	Proposed outlet at L.S.11,700 - - - -	1,330
(6)	Excavating a surplus channel from the outlet -	1,220
(7)	Improvements to the existing calingulah at the Right flank of the tank. - - -	730
(8)	Three cement pipe sluices and one masonry sluice	775
(9)	Unforeseen works including planting Bench-marks stones to channel and tank - - -	135
	T o t a l-----Rs	20,050

(2

2. The following alterations have been made in the Supg. Engr's estimate

(a) Item No.4 Improvements to Subramania Thevar anicut

Wings raised to 2 ft. above M.W.L.

Cement concrete substituted for surki concrete in the top 6" of the 10 ft. apron.

The above alterations have increased the estimate for this item from Rs.745 to Rs.1,015

(b) Item No.5. Outlet [illegible]

Wings raised to 2 ft. above M.W.L

Width of concrete under the front wings increased by 3". The estimate for this item has been increased from Rs.1,330 to Rs.1,360.

3. With regard to item No.1 the Supg. Engr. should satisfy himself ~~before the work is put in hand~~, as to the necessity for revetment, which should not be carried out unless really ~~necessary~~ required for the safety of the tank.

4. The value of the land, proposed to be acquired for the surplus channel does not appear to have been verified by the Revenue Department. It should have been ascertained beforehand from a responsible officer of that Department. This should be done now.

5. The estimate was altered in this

office

16

20,350

office, amounting to ₹23,050, is recommended for sanction.

[signature] 11/8/44

[initials] 12.8.44

To the Joint Secy: to Govt.

P.W.D. (1).

PUBLIC WORKS DEPARTMENT,

IRRIGATION BRANCH.

Tabling Abstract.

No 11 Kuttalaperi tank and supply channel, Tenkasi taluk, Tinnevelly Dt.

Sanctioning with remarks an estimate amounting to Rs 20,350 for improvements and repairs to ______.

Cross References.

Canals & Channels
Tanks

Read the following :—

Note by the Chief Engineer for Irrigation No 2222/14-1, d/ 12.8.1914

Circulated to

Print notes

ORDER—No. 437 I, dated 1-9-14

Press

The recommendation of the Chief Engr for Irrigation is approved and the following estimate is sanctioned:—

Provincial

Irrigation

43. Minor Works and Navigation

Class III Minor Works for which neither Capital nor

Revenue Accounts are kept.
(a) In charge of the P.W.D.

T.R.S. Repairs.

T.R.S. Dn, VI circle.

Improvements and repairs to No. 11 Kuthalaperi tank and Supply Chl, Tenkasi Tk, Tinnevelly D.

Estimate ...... Rs 20,350

2/ The sanction accorded above is registered as No. 62.I. of 1914-15

3/ The attention of the Supt Engr. VI circle, is drawn to paras 3 and 4 of the foregoing note by the Chief Engr. for Irrign.

13/8/14
D.I.

WH 13.8.14
I

p.5 Cf

S.C. despd 7/10

To
The Chief Engr. for Irrign.
" S.E. VI with plans and estimates
" A.G. Madras

Not E.T.

despd 7/10
13.8.14

13-8-1914

DESPATCHED
Date 1. 9. 1914
Enclos. Plans & est. and plans to S.E. VI

Note by E.T. & ...

When given for copying ____
When copied ____
When examined ____
When signed ____
} 191 .

READ AGAIN G.O. No. , DATED 191 .

CURRENT No.

ENCLOSURES TO C. No.

ORDER OF GOVERNMENT

A A A A A A A

LETTER OF GOVERNMENT

STATEMENT WITH DITTO.

PAPERS NOT FILED UP, BEING MEANT FOR DESPATCH IN ORIGINAL.

N.B.—
A = Copy in full.
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